Chapter 19
Effects of Commodity and Asset Bubbles on Inflation in Indonesia

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ABSTRACT

This chapter aims to investigate the possible impacts of commodity and asset bubbles on inflation in Indonesian economics. The analysis is facilitated by a macroeconomic model described by a couple of structural equations which consist of several exogenous variables as shock generators. The model is basically a linear rational expectation model (LREM) and solved by implementing undetermined coefficient methods. A series of simulation based on the state space representation of the model with respect to an impulse response function is performed to highlight some of key features of current inflation trends. It is shown that consumer price inflation can be propagated by both hikes in international commodity prices and assets prices. Consequently, inflation can be more difficult to manage during an episode of commodity and asset bubbles. Indeed, such an episode is very common to emerging economies during the last few years and thereby it is not surprising that monetary authorities tend to miss the inflation target very often. It suggests that the authorities should take into account the future movement of commodity and assets prices when setting the target.

INFLATION TARGETING FRAMEWORK

Inflation targeting framework (ITF) is increasingly epidemic amongst central bankers of today. Indonesia, like many emerging economies, for instance, by law gives her central bank inflation stabilization as a sole formal mandate. Thus all efforts, resources and functions of the central bank have to be directed to achieve a pre-specified inflation target. Technically speaking, this will simplify the task of the central bank, making it easier to fulfill the mandate. Despite that, however, as shown by the Indonesian experience, this

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single objective is not easy to carry. The nature of a small open economy which is prone to any kind of global shocks, among other things, seems to make the authority has limited capacity to direct price equilibrium toward a certain intended level.

Studies on inflation targeting in Indonesia economics are some. Chowdhury and Siregar (2004) explore the relationship between inflation and growth under fiscal and monetary constraints, which indicate a higher inflation rate than what is currently targeted. Moreover, Chowdhury and Ham (2009) examine, by using the threshold VAR model, changes in the relationship between inflation and growth for searching a threshold level of inflation. Siregar and Goo (2010) highlight basic features of the inflation targeting policies adopted by Indonesia and evaluate the commitment of the monetary authorities and the overall performances, showing that the country has had some success. Alamsyah, Joseph, Agung, and Zulverdy (2001) conduct a comprehensive study on the implementation of inflation targeting in Indonesia before, during, and after crisis period, leading to an outline of a preliminary design for a suitable inflation targeting framework for Indonesia. In boarder case, Ito and Hayashi (2004) provide the first comprehensive survey and assessment of inflation targeting in Asia including Indonesia. Lessons of inflation targeting in international perspectives can be found in Bernanke, Laubach, Mishkin, and Posen (1999).

Some descriptions about current trend in Indonesia's inflation rate are as follows. In January 2008, the inflation rate was just about 6 percent, which for the Indonesian case could be considered as normal. It then accelerated very rapidly and by June it already reached a mere 12 percent level. In just a few months, it became double. In January 2009, it begun to decelerate very quickly and by August it was just slightly below 3 percent. Short after that, the inflation gained a momentum to increase again and by the end of 2010 it already backs to the 7 percent level. Starting 2011, the inflation decelerated again. Figure 1 clearly shows this roller-coaster type of inflation from January 2008 to September 2011 (45 periods).

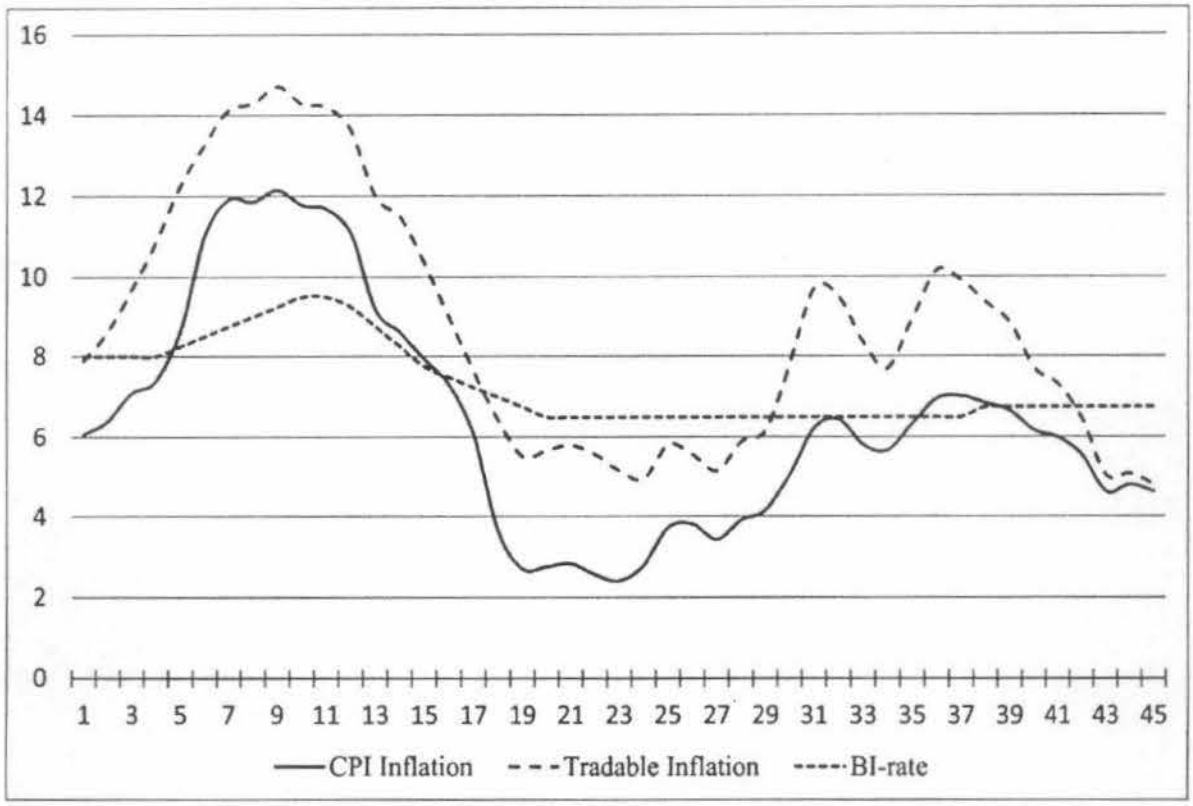
In the same figure it is also shown the policy rate, i.e., BI-rate implemented by Bank Indonesia, which is stubbornly constant during the episode. Some would suggest that the authority did nothing to inflation. Other may conclude that it was too difficult for the authority to manage it. What is clear is that inflation does not seem to move toward the intended level.

This paper shed lights on the issue that ITF might not be an easy task to be carried out within a small open economy context. The boom and bust of commodities and assets prices may impair any small countries to stabilize inflation. The ups and downs of global prices of commodities and assets are not new. But the volatilities during the last ten years have reached an unprecedented level. Indeed, it is the size of volatilities that poses the challenge.

More specifically, this paper addresses the consequences of two global shocks, i.e., commodity and asset prices, on inflation management in a small open economy. The links between international price and domestic price are already well known. Price of tradable goods is part of the CPI composite. However, the effect of asset price on inflation is somewhat less clear. In this case, one of the contributions of this paper is in simplifying such effect under rational expectation framework.

It is well understood that a series of crises: subprime mortgage crisis in 2006, the banking credit crisis in 2007, and the global financial crisis in 2008, is originated from an asset bubble in real estate. In 2005 the price of real estate rises quickly over a short period of time due to excess demand as many people bought homes for investments to sell as prices kept rising. Unfortunately, prices started to fall in 2006 and triggered a series of consequences. The financial crisis has turned the attention of economists to asset price bubbles, or, more generally, to financial instability, led to a consensus on the need for a new paradigm of monetary policy associated with the occurrence of large asset price booms and busts (Bean, Paus-

Figure 1. CPI inflation, tradable inflation, and Bank Indonesia rate



tian, Penalver, & Taylor, 2010). Recent studies on the relationship between monetary policy and asset price dynamic are as follows. Kim and Lim (2009) investigate the development of housing prices in conducting monetary policy, tailored for the Korean economy, by comparing the stabilization performances of several interest rate rules. Issing (2009) indicates that a monetary policy strategy that monitors closely monetary and credit developments as potential driving forces for consumer price inflation in the medium to long run has an important positive side effect. The first issue of 2001 of Czech Journal of Economics and Finance focuses on the topic of asset price bubbles and financial instability, which covers the relationship between monetary policy, asset prices, and financial stability in the last 20 years, the classification and identification of asset price bubbles, the evidence of overpriced real estate in the Czech Republic and its determinant, and the consequences of equity mispricing (a bubble) and the correction thereof (the bubble bursting) for the real sector of the economy.

The rest of the paper can be highlighted as follows. In the next section, the challenges and limitations of ITF will be discussed briefly. Indonesian case will be taken as an example. The common problem faced by emerging economies is how to set appropriate monetary policy responses that is consistent with ITF under a relatively high volatility of commodity and asset prices. After some introduction in Sections 1 and 2, we provide in Section 3, a linear rational expectation model (LREM), which captures the effects of international commodity and asset prices. This will be followed by a discussion of some simulation results derived from the model in Section 4. Section 5 provides conclusion and policy implications.

INFLATION TARGETING: CHALLENGES AND LIMITATIONS

There are two important forces influencing today inflation: global commodity prices and the wave of asset bubble-bust. While international commodity prices have direct implications on domestic price formation, policy makers tend to have insufficient information regarding the consequences of asset price on inflation management. It will be argued that both have equally important implications.

There is an increasing concern over the effect of international commodity price on domestic inflation, especially amongst emerging market. Since 2000, global inflation has risen alongside with accelerated commodity prices. The rise of commodity price was exceptionally high between 2006 and 2008. For instance, oil price reached its historic height at USD145 per barrel around the third quarter of 2008. Following the worsening of global financial price, commodity prices collapsed together with stock prices worldwide meltdown by the end of 2008. Commodity prices gain its momentum to increase again since mid-2009 before the sign of global recovery was clear. However, it felt again following the European debt crisis in 2011.

The effect of commodity price on inflation in Indonesia is captured in Figure 1. There seems to be a strong co-movement between CPI-inflation and tradable goods inflation. Moreover, the later tends to be higher than the former. Managing inflation of tradable goods is not an easy task. Because the price is set internationally, the only room available for the monetary authority is to activate the so called exchange rate targeting. If a stable domestic price of tradable should be attained, the authority has to dynamically adjust the exchange rate in accordance to the movement in international price. But this is also problematic especially when exchange rate is used to pursue other objectives such as export competitiveness. While a stable price may sometimes require an appreciation of exchange rate, maintaining export competitiveness requires a relatively depreciated exchange rate. With this possible trade off, the authority has to surrender one against the other. The choice will never be so easy.

Against this backdrop, inflation management may be too costly since smooth inflation has to be compensated by a greater volatility in exchange rate. For a small open economy like Indonesia, this attempt may not be effective at all since exchange rate management has its own dynamics (see for example Sugema and Bakhtiar (2009)). If exchange rate management has to serve inflation targeting, then intervention in the exchange market could become more complicated. This is particularly so because exchange rate formation is more related to capital flows. For many emerging markets with volatile capital flows, exchange rate management is far more complicated. The bottom line is that, inflation management is now more complicated. Inflation can no longer be treated as a single variable. Different component in the CPI can have different dynamics from time to time. For the time being it seems the tradable components that become the 'prime mover' of inflation. For the other time, it may not be the case. Thus, different situation needs different strategy. Inflation management is no longer about loose or tight monetary policy. It is a detailed operation of how to influence each component of CPI.

The other important issue is about the effect of asset price on inflation. There are at least two transmission mechanisms through which monetary policy can affect asset price and there are also three channels through which asset price may affect inflation. The bottom line is that we can simplify the analysis as: (i) how can monetary policy affect asset price and (ii) how important is asset price in the inflation formation. If both exist, we can hope that there is a way for monetary policy makers to manage inflation through asset price.

Suppose that the authority decides to adopt a tight bias monetary policy by increasing nominal short-term interest rate. There are two transmission mechanisms suggesting that there should be

a negative relationship between interest rate and assets price. The first mechanism is the so called the user cost theory. An increase in short-term interest rate tends to increase the user cost of capital. This in turn can depress the demand for asset, which tends to give a downward pressure on asset price. The second mechanism follows the first one. If a monetary tightening is expected, household would foresee the coming pressure on asset price. Thus, the current user cost of capital would increase and therefore asset price tends to decelerate.

The other issue is how the price of asset affects CPI inflation. There are two channels which suggest positive relationship between asset price and consumer price (CPI). The first channel is the famous wealth effect on consumption and the foundation of this can be traced back to Modigliani and Brumberg (1954). Stocks, houses and other assets are the conduits to accumulate wealth. An increase in assets price means an increase in wealth, which tends to stimulate consumption. In other words there should be a marginal propensity to consume of wealth on top of current income. As wealth increases, consumption increases, and this will give an upward pressure on consumer prices. There should be a positive relationship between asset prices and consumer prices. The second is the credit channel. Assets can be used as collateral to obtain loans from banks. As the value of assets increases, potential debtors may ask a higher credit limits and therefore making them possible to expand expenditures, see Mishkin (2007). Again, there would be an upward pressure on consumer prices due to consumption financing.

In summary there should be two possible channels for explaining the effect of asset prices on consumer prices. Both channels suggest positive relationship between asset prices and consumer prices. There should be also two possible transmission mechanisms through which monetary authority can affect assets prices. Both suggest that monetary tightening can produce a downward pressure on asset price. The discussion of the effects of commodity and assets price on domestic inflation raises two key issues. The first one is how monetary authority deals with the volatility of commodity and asset price. The second one is how monetary authority can better measure the effect of the boom and bust of commodity and asset market on domestic inflation and the overall macroeconomic performance. The following section tries to address these issues.

THE MODEL

In this paper we use the most up to date modeling techniques to facilitate the analysis. We employ a dynamic open economy macroeconomic model that features rational expectations, optimizing agents, and slowly-adjusting price of goods. Pioneering publications in the area were provided by Obstfeld and Rogoff (1995); Obstfeld and Rogoff (1996). A more recent work can be found in McKibbin and Stoeckel (2009). We develop an open economy macroeconomic model governed by a couple structural equations. Since the dynamics of the model are backward and forward looking, we adopt the so-called linear rational expectation model (LREM), which is solved by using undetermined coefficient method, to analyze the macroeconomic model, see McCallum (1998, 2001), McCallum and Nelson (2001). A rather comprehensive review on analyzing and solving the LREM can be found in Anderson (2006).

Compared to others, our model offers two distinctive features as follow. First, there is a direct link between international price and consumer price index. The movement in CPI is composed by two components, tradable and non-tradable prices. Tradable goods consist of exportable and importable and the prices are fully determined by international market. Domestic price of such goods is modeled as international price multiplied by nominal exchange rate. Thus inflation is determined by three forces: price of tradable, price of non-tradable and exchange rate. Second, asset

price is considered to be an important factor altering the general equilibrium. The previous discussion suggests two important points: (i) monetary policy can affect assets prices and (ii) assets prices may have positive influences on expenditure and thereby consumer prices.

Structural Equations

There are fifteen equations considered in the model. Most equations are influenced by shock processes denoted by e_t. We denote by $\mathbb{E}_t$ the expectation operator at period t. Output gap $\tilde{y}$ is the deviation between actual output y and potential output $\bar{y}$, where potential output is influenced by the competitiveness, which reflected by the real exchange rate q, and the technological shock $e^{\bar{y}}$. The dynamics of output gap and potential output are described by following equations:

$$\tilde{y}_t = y_t + \bar{y}_t \tag{1}$$

$$\bar{y}_t = \gamma q_t + e^{\bar{y}}. \tag{2}$$

For the price motion p, we follow the common definition about the inflation rate Δp, i.e., the difference of the price in the current and last periods:

$$\Delta p_t = p_t - p_{t-1}, \tag{3}$$

while real exchange rate q and nominal exchange rate s are associated by ordinary relationship

$$q_t = s_t - p_t + e_t^q, \tag{4}$$

where the shock process e^q constitutes the law of one price under normalized international price.

The dynamics of nominal interest rate R and real interest rate λ are governed by following equations:

$$R_t = \mathbb{E}_t s_{t+1} - s_t + e_t^s, \tag{5}$$

$$\lambda_t = R_t + \mathbb{E}_t \lambda_{t+1} - \mathbb{E}_t \Delta p_{t+1}. \tag{6}$$

where the shock process e^s reflects the risk premium with non-constant variance and possibly inter-correlated and (5) refers to the uncovered interest parity (UIP).

Private expenditure c obeys the following balance:

$$\beta B_1 \mathbb{E}_t c_{t+1} = B_2 c_t - (1 - h\beta)\lambda_t - \kappa_1 p_t^A + e_t^c. \tag{7}$$

The coefficient $0 < \beta < 1$ involved in this equation is the discount factors. The shock process e^c describes the stochastic shock relates to the household preferences on the current and forthcoming consumption level c_t and c_{t+1}. The forthcoming consumption depends on the real interest rate λ. In other words, the inter-temporal substitution factor is considered as an indicator which affects the consumption level. The price level of asset p^A may have effects on expenditure and thereby consumer prices.

The equations for export level x and net-export level $\tilde{x}$ are as follow:

$$x_t = b_2 q_t + b_1 y_t^* + e_t^x, \tag{8}$$

$$\tilde{x}_t = x_t - b_3 y_t - (b_1 - 1) q_t, \tag{9}$$

where coefficients b_1 and b_2 are, respectively, the substitution elasticity coefficients between real exchange rate q and international output y^*, which is exogenously considered. In (9), $b_1 - 1$ can be seen as the substitution coefficient of elasticity between goods and labors in the production process.

The aggregate supply equation follows that of Fuhrer-Moore:

$$\Delta p_t = \alpha \tilde{y}_t + \tfrac{1}{2}(\Delta p_{t-1} + \mathbb{E}_t \Delta p_{t+1}) + e_t^p. \tag{10}$$

where the current inflation rate Δp is determined by the output gap $\tilde{y}$ as well as the average of the last rate and the expectation for the next period. The shock process e^p is assumed to have zero mean and constant variance. Aggregate expenditure y is given by

$$y_t = \eta_1 c_t + \eta_2 x_t + \eta_3 g_t, \tag{11}$$

where g denotes the government expenditure. The above aggregate expenditure exhibits the simplification of $y_t = \eta_1 c_t + \eta_2 x_t + \eta_3 g_t + \eta_4 I$, where I denotes the investment level. By (11), it does not mean that investment and import are excluded from the model. Note that the investment has been taken into account in (7), where h denotes the elasticity coefficient between investment level and the real interest rate. Furthermore, the import is exclusively considered as the material input to the production of home-country goods, since most of the import consists of capital and material goods.

The monetary authority is assumed to obey the monetary policy (MP) rule in launching a monetary policy, where the nominal interest rate R in the current period influenced by the backward expectation of the inflation rate Δp, the output gap $\tilde{y}$, and weight on inflation rate and output ψ as provided by (12) and (13) as follow:

$$R_t = (1-\mu_3)\mathbb{E}_{t-1}\Delta p_t + \tfrac{1}{2}\mu_2(1-\mu_3)\mathbb{E}_{t-1}\tilde{y}_t + \mu_3 R_{t-1} + \mu_4(1-\mu_3)\mathbb{E}_{t-1}\psi_t + e_t^R, \tag{12}$$

$$\psi_t = \Delta p_t + y_t - y_{t-1}. \tag{13}$$

As key features, we decompose inflation into two components, tradable Δp^T and non-tradable Δp^N and assume that monetary policy affects the price of asset p^A directly as previously discussed:

$$\Delta p_t = \omega_N \Delta p_t^N + (1-\omega_N)(\Delta s_t + \Delta p_t^T), \tag{14}$$

$$p_t^A = p_{t-1}^A - \kappa_2 R_t + e_t^A, \tag{15}$$

where $\Delta s_t = s_t - s_{t-1}$.

Linear Rational Expectation Model

Let w be an $n_w \times 1$ vector of non-predetermined endogenous variables, k be an $n_k \times 1$ vector of predetermined endogenous variables, and z be an $n_z \times 1$ vector of exogenous variables. The standard form of LREM under consideration is given by

$$\boldsymbol{A}\mathbb{E}_t \begin{bmatrix} w_{t+1} \\ k_{t+1} \end{bmatrix} = \boldsymbol{B} \begin{bmatrix} w_t \\ k_t \end{bmatrix} + \boldsymbol{C} z_t, \tag{16}$$

$$z_t = \phi z_{t-1} + \varepsilon_t, \tag{17}$$

where $\boldsymbol{A}$ is a square array of size $n_w \times n_k$ represents the structural coefficients array for future variables, $\boldsymbol{B}$ is a square array of the same size represents those for contemporaneous variable, $\boldsymbol{C}$ is an $n_w \times n_z$ matrix which serves as coefficient of exogenous variables, ε is an $n_z \times 1$ white noise vector, and thus z is a first-order autoregressive process whose coefficients are collected in ϕ.

By using undetermined coefficient method of McCallum (1998), the solution of model (16) and (17) can be stated as

$$w_t = \boldsymbol{M} k_t + \boldsymbol{N} z_t, \tag{18}$$

$$k_{t+1} = Pk_t + Qz_t. \tag{19}$$

where M, N, P, and Q are to be determined matrices. It is clear that the solution writes the non-predetermined endogenous variables as a linear combination of predetermined endogenous variables and exogenous variables. The model and its solution can then be written in the form of state space as follow:

$$\begin{bmatrix} k_{t+1} \\ z_{t+1} \end{bmatrix} = \begin{bmatrix} P & Q \\ 0 & \phi \end{bmatrix} \begin{bmatrix} k_t \\ z_t \end{bmatrix} + \begin{bmatrix} 0 \\ I \end{bmatrix} e_{t+1}, \tag{18}$$

$$w_t = \begin{bmatrix} M & N \end{bmatrix} \begin{bmatrix} k_t \\ z_t \end{bmatrix}, \tag{19}$$

from which an impulse response based simulation and analysis can be performed.

RESULTS AND DISCUSSION

This section discusses the simulation results based on the impulse response function (IRF) up to twenty quarters. Two shocks are performed to the system; an increase in international commodity price and asset price. The implications of this simulation are also highlighted.

Figure 2(a) provides the IRF for the impact of increase in international commodity price on CPI inflation. It is clear that an increase in tradable price would induce domestic inflation in the short run. The effect would not last very long, and inflation backs to its origin in the long-run. Note that the analysis only captures a single shock, and thus it is quite natural that this has no long-run effect. In reality, the international price is continuously changing, from one level to another, ups and down. Thus, in the long-run, there is a strong co-movement between tradable components and CPI inflation. Indeed, this is the case for Indonesia.

Figure 2(b) tracks the effect of the shock in international price on output. Output tends to have a stronger positive response in the first few periods followed by weaker negative responses but with longer period. It is safe to say that the effect on output is relatively neutral in the sense that positive effects are equibalanced by the negative effects.

Figure 2(c) presents IRF of inflation with respect to a shock on assets price. Inflation responses negatively in the first period and followed by positive up to tenth quarter and then back to negative but with very marginal size. It is fair to say that an increase in asset price could induce inflation, since positive responses seem to outweight negative responses.

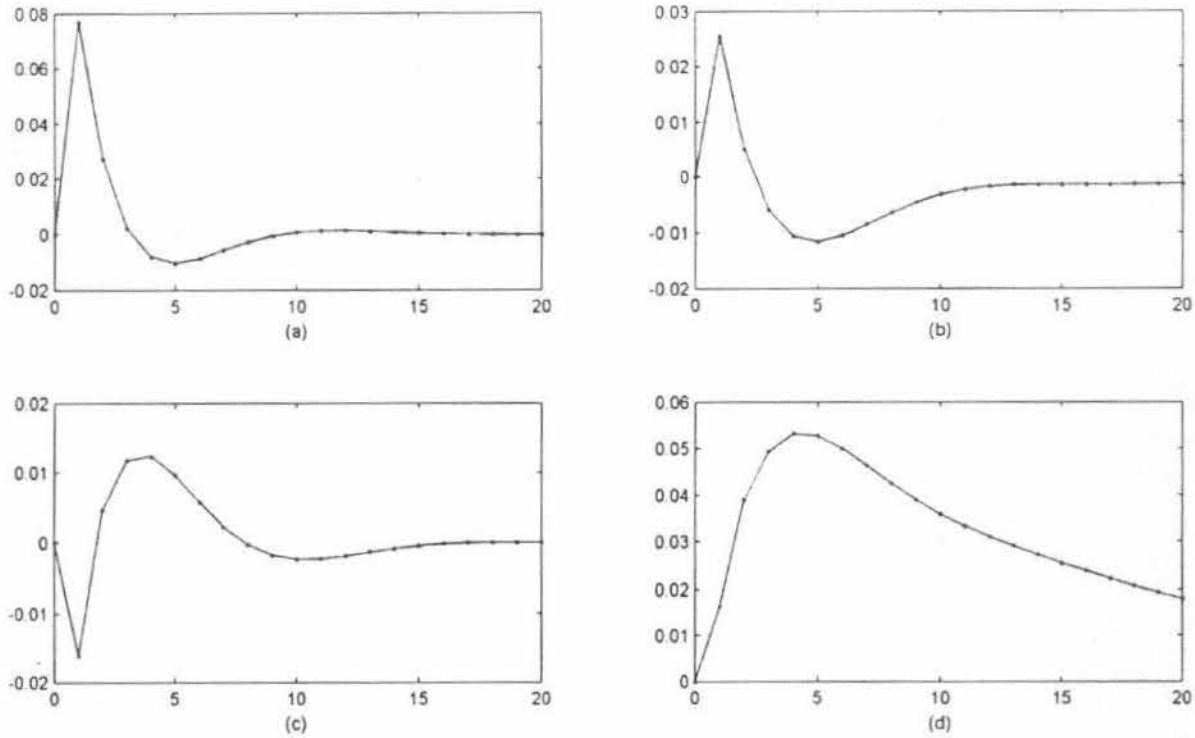
Fig. 2(d) tracks the effect of asset price shock on output. It is consistent with the notion that asset price has a wealth effect on consumption. It also confirm that asset price tend to coincide with economic performance. However, it is very surprising that a single shock could have a relatively persistent effect.

This finding could lead to a policy dilemma. Since asset price tend to have a quite long positive impact on output, government would be very reluctant to systematically deflating the boom. It is politically advantageous to maintain such a boom. Thus, keeping the boom as long as possible is politically desirable. On the contrary, any attempt to deflate the price would be politically unacceptable.

It is in this context, the government of Indonesia–from the President, the minister to the governors–very often makes a view that increasing asset price is a reflection of success story of development progress. Just like in other countries, politicians are always myopic; taking all positive credits for themselves without concerning that 'positive' can turn to the other way.

Note that under the current policy environment, asset price is not considered as important to be managed by both fiscal and monetary authority.

Figure 2. Impulse response functions of: (a) inflation due to commodity price shock, (b) output due to commodity price shock, (c) inflation due to asset price shock, and (d) output due to asset price shock



The attitude is that increasing asset price is a good sign, while decreasing is often blamed to external factors. For instance, the assets bubble was often cited as a result of sound economic policy. On the other hand, when it came to a bust in 2008, the officials blamed the global financial crisis. Even worst, up to now there is no serious attempt in gathering information about the development of asset price except for stock market. Statistics on housing price are very unreliable due to weaknesses in data collection. For example, official statistic from the central bank suggests a 4 percent increase in house price in six major cities in 2010 amid rapid cities expansion both vertically and horizontally. On the other hand private survey suggests 16 to 21 percent price increase. The bottom line is that asset price has never been a concern at all amongst policy makers.

In summary, there is an evidence that a 'roller coaster' inflation rate experienced by Indonesia could be the result of other roller coasters namely asset and international commodity prices. Given the difficulty in managing exchange rate to soften tradable goods' inflation, domestic price will continue to follow the roller coaster in the international market. Moreover, since assets price has never been a concern for monetary policy, the effects of asset price on domestic inflation would still be untouchable.

Discuss future and emerging trends. Provide insight about the future of the book's theme from the perspective of the chapter focus. Viability of a paradigm, model, implementation issues of proposed programs, etc., may be included in this section. If appropriate, suggest future research opportunities within the domain of the topic.

CONCLUSION

In this paper we have developed a theoretical linear rational expectation model (LREM) for Indonesia. An open-economy with forward looking agents has been adopted and connections to international market are incorporated. Moreover, the effect of asset price on the general equilibrium is also included. Based on the model we evaluate the current 'roller coaster' inflation. Two candidates of source of disturbance are considered; international commodity price and asset price. International commodity price has a direct effect on domestic inflation. The result of IRF shows that commodity price should have positive short-run effect on domestic inflation. The other IRF shows that asset price could be an important source of inflationary pressure.

A relatively exceptional swing in commodity price poses a challenge for the monetary authority. The effect of the price shock should be counter balanced by the movement in exchange rate. This can be problematic when exchange rate management is directed for other objectives such as export promotion. The reluctance of Indonesian authority to adjust exchange rate in accordance to the movement in international price should suggest this problem. The result is that inflation follows the roller coaster in international price.

The findings also suggest that the authority should be more concerned with assets price as it may have important implication for inflation management. However, the current practice suggest that the possible effect of asset price has been neglected. Thus, it will not be surprising that the authority would not be able to set and achieve a reasonable inflation target.

REFERENCES

Alamsyah, H., Joseph, C., Agung, J., & Zulverdy, D. (2001). Towards implementation of inflation targeting in Indonesia. *Bulletin of Indonesian Economic Studies, 37*(3), 309–324. doi:10.1080/00074910152669154

Anderson, G. S. (2006). *Solving linear rational expectations models: A horse race*. Washington, DC: Federal Reserve Board.

Bean, C., Paustian, M., Penalver, A., & Taylor, T. (2010). *Monetary policy after the fall*. The Federal Reserve Bank of Kansas Economic Policy Symposium, Jackson Hole, Wyoming.

Bernanke, B. S., Laubach, T., Mishkin, F. S., & Posen, A. S. (1999). *Inflation targeting: lessons from international experience*. Princeton: Princeton University Press.

Chowdhury, A., & Ham, R. (2009). Inflation targeting in Indonesia: Searching for a threshold. *The Singapore Economic Review, 54*(4), 645–655. doi:10.1142/S021759080900346X

Chowdhury, A., & Siregar, H. (2004). Indonesia's monetary policy dilemma: Constraints of inflation targeting. *Journal of Developing Areas, 37*(2), 137–153. doi:10.1353/jda.2004.0023

Issing, O. (2009). Asset prices and monetary policy. *The Cato Journal, 29*(1), 45–51.

Ito, T., & Hayashi, T. (2004). Inflation targeting in Asia. *HKIMR Occasional Paper, 1*.

Kim, J., & Lim, G. (2009). House prices and the stance of monetary policy: The case of Korea. *Global Economic Review: Perspectives on East Asian Economies and Industries, 38*(4), 371–384. doi:10.1080/12265080903391750

Klein, P. (2000). Using the generalized Schur form to solve a multivariate linear rational expectation model. *Journal of Economic Dynamics & Control, 4*(10), 1405–1423. doi:10.1016/S0165-1889(99)00045-7

McCallum, B. T. (1998). Solutions to linear rational expectations models: A compact exposition. *Economics Letters, 61*(2), 143–147. doi:10.1016/S0165-1765(98)00161-X

McCallum, B. T. (2001). Software for RE analysis. *QM & RBC Codes, 144.*

McCallum, B. T., & Nelson, E. (2001). Monetary policy for an open economy: an alternative framework with optimizing agents and sticky prices. *NBER Working Paper, 8175.*

McKibbin, W. J., & Stoeckel, A. (2009). The global financial crisis: causes and implications. *Working Paper in International Economics*, Lowy Institute, Australia.

Mishkin, F. S. (2007) Housing and the monetary transmission mechanism. *The Jackson Hole Symposium*, Federal Reserve Bank of Kansas City.

Modigliani, F., & Brumberg, R. (1954). Utility analysis and the consumption function: an interpretation of cross-section data. In K. K. Kurihara (Ed.), *Post Keynesian Economics* (pp. 388–436). New Brunswick: Rutgers University Press.

Obstfeld, M., & Rogoff, K. (1995). Exchange rate dynamics redux. *Journal of Political Economy, 103*(3), 624–660. doi:10.1086/261997

Obstfeld, M., & Rogoff, K. (1996). *Foundations of international macroeconomics*. Cambridge, MA: MIT Press.

Siregar, R. Y., & Goo, S. (2010). Effectiveness and commitment to inflation targeting policy: Evidence from Indonesia and Thailand. *Journal of Asian Economics, 21*(2), 113–128. doi:10.1016/j.asieco.2009.12.002

Sugema, I., & Bakhtiar, T. (2009). (In)effectiveness of monetary policy in managing inflation: a linear rational expectation model. *Policy Workshop on ITF Evaluation*, Bank Indonesia.

KEY TERMS AND DEFINITION

Asset Bubble: A situation in which prices of asset appear to be based on questionable or inconsistent views about the future.

Commodity Bubble: A situation where demand for commodity far exceeds the supply such that inflates the price for the product higher than it should be.

Consumer Price Index: The timeliest economic indicator in tracking inflation since it measures changes in the price level of consumer goods and services purchased by households.

Impulse Response: The reaction of a system as a function of time when some external changes are introduced to the system. Impulse may be represented mathematically by a Dirac delta function.

Inflation Targeting: Strategy for monetary policy performed by central bank to meet predetermined and publicly displayed targets for the annual rate of inflation.

Open Economy: An economy that allows the flow of activities between countries. A country's economy openness can be measured by the fraction of its GDP devoted to imports and exports.

Rational Expectation Model: Model that constructed based on the assumption where economic agents are allowed to exploit available information in forming their expectations.